

What is claimed is:

1. An apparatus for securing an aspherical ocular globe, comprising:  
a ring having an annular vacuum channel that is connectable to a vacuum source  
5 and an aperture sized to receive and expose the cornea;  
wherein the annular vacuum channel has an aspherical ocular globe-engaging  
surface comprising an inferior engaging surface and a superior engaging surface.

2. The apparatus of claim 1, wherein the aperture is non-circular.

10

3. The apparatus of claim 1, wherein the aperture is a shape selected from the group  
consisting of circular, elliptical, oval and ovoid.

15

4. The apparatus of claim 1, wherein the inferior engaging surface and the superior  
engaging surface are defined by a major meridian and a minor meridian having different  
radii.

5. The apparatus of claim 1, wherein the inferior engaging surface and the superior  
engaging surface are defined by a plurality of meridians having different radii.

20

6. The apparatus of claim 1, wherein the non-circular plane section of the inferior  
engaging surface is formed by a non-circular wall, a beveled wall, or a variable length  
wall.

25

7. The apparatus of claim 1, wherein the non-circular plane section of the superior  
engaging surface is formed by a non-circular wall or a beveled wall.

30

8. The apparatus of claim 1, wherein the inferior and superior engaging surfaces each  
has a shape selected from the group consisting of circular, elliptical, oval, ovoid, and  
combinations thereof.

9. The apparatus of claim 1, wherein the inferior and superior engaging surfaces each has one or more concave surfaces that mate with a convex surface of the ocular globe and corneal region.

5 10. The apparatus of claim 1, wherein the ring is made from a material selected from stainless steel, titanium, a synthetic plastic, rubber, and combinations thereof.

11. A kit for use with a microkeratome having a cutting head assembly, comprising:  
a plurality of rings for securing aspherical ocular globes, wherein each of the  
10 plurality of rings has:  
(1) an aperture sized to receive and expose a cornea,  
(2) a fixed dimension interface for interfacing with the cutting head assembly,  
(3) an annular vacuum channel that is connectable to a vacuum source, wherein  
the annular vacuum channel has an aspherical ocular globe-engaging surface comprising  
15 an inferior engaging surface and a superior engaging surface,  
wherein two or more of the rings differ in a manner selected from aperture dimension or shape, superior engaging surface dimension or shape, inferior engaging surface dimension or shape, and combinations thereof.

20 12. The kit of claim 11, wherein the aperture is non-circular.

13. The kit of claim 11, wherein the aperture is a shape selected from the group consisting of circular, elliptical, oval and ovoid.

25 14. The kit of claim 11, wherein the inferior engaging surface and the superior engaging surface are defined by a major meridian and a minor meridian having different radii.

15. The kit of claim 11, wherein the inferior engaging surface and the superior engaging surface are defined by a plurality of meridians having different radii.

16. The kit of claim 11, wherein the non-circular plane section of the inferior engaging surface is formed by a non-circular wall, a beveled wall or a variable length wall.

17. The kit of claim 11, wherein the non-circular plane section of the superior engaging 5 surface is formed by a wall or a beveled wall.

18. The kit of claim 11, wherein the inferior and superior engaging surfaces each has a shape selected from the group consisting of circular, elliptical, oval, ovoid and combinations thereof.

10

19. The kit of claim 11, wherein the inferior and superior engaging surfaces each has one or more concave surfaces that mate with a convex surface of the ocular globe and corneal region.

15 20. The kit of claim 11, wherein the plurality of suction rings are made from a material selected from stainless steel, titanium, a synthetic plastic, rubber, and combinations thereof.

21. A microkeratome for performing a lamellar keratotomy of an aspherical ocular globe, 20 comprising:  
a ring having an annular vacuum channel that is connectable to a vacuum source, an aperture sized to receive and expose the cornea, and an interface, wherein the annular vacuum channel has an aspherical ocular globe engaging surface comprising an inferior engaging surface and a superior engaging surface;

25 a blade suitable for corneal resections;  
a cutting head for carrying the blade over the guide ring through a cutting path defined by the guide ring;  
an adjustable cornea compression device connected to the cutting head for at least partially compressing the cornea ahead of the blade so as to set the corneal resection to a 30 desired shape and thickness;

means for driving the cutting head and the cornea compression device across the guide ring.

22. The microkeratome of claim 21, wherein the aperture is non-circular.

5

23. The microkeratome of claim 21, wherein the aperture is a shape selected from the group consisting of circular, elliptical, oval and ovoid.

10 24. The microkeratome of claim 21, wherein the inferior engaging surface and the superior engaging surface are defined by a major meridian and a minor meridian having different radii.

15 25. The microkeratome of claim 21, wherein the inferior engaging surface and the superior engaging surface are defined by a plurality of meridians having different radii.

20 26. The microkeratome of claim 21, wherein the non-circular plane section of the inferior engaging surface is formed by a wall, a beveled wall or a variable length wall.

25 27. The microkeratome of claim 21, wherein the non-circular plane section of the superior engaging surface is formed by a wall or a beveled wall.

28. The microkeratome of claim 21, wherein the inferior and superior engaging surfaces each has a shape selected from the group consisting of circular, elliptical, oval, ovoid and combinations thereof.

25 29. The microkeratome of claim 21, wherein the inferior and superior engaging surfaces each has one or more concave surfaces that mate with a convex surface of the ocular globe and corneal region.

30. The microkeratome of claim 21, wherein the aspherical ocular globe-engaging surface is suitable for contacting an ocular globe and corneal region having a refractive error selected from astigmatism, hyperopia and myopia.

5      31. The microkeratome of claim 21, wherein the cutting path is horizontal.

32. The microkeratome of claim 21, wherein the cutting path is pendular.

10